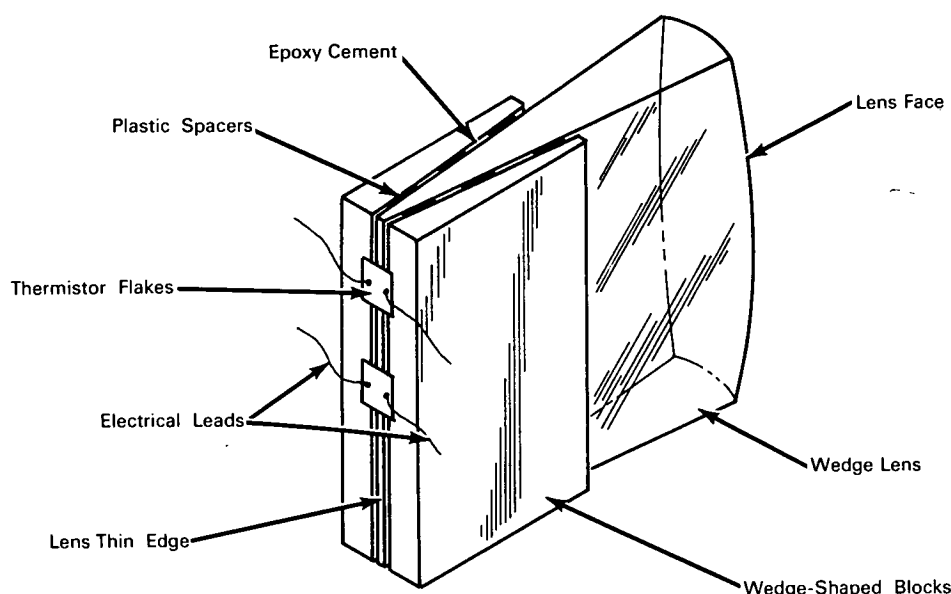


NASA TECH BRIEF



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Wedge Immersed Thermistor Bolometer Measures Infrared Radiation



The problem: To design a detector sufficiently sensitive to measure infrared radiation in the atmosphere in the 15-micron CO_2 absorption band. The measurements must be extremely precise because they are to be used in a method of inferring the vertical temperature structure of the atmosphere. In the employment of spectrometers, whose aspect ratios are other than unity due to entrance slit configuration, the use of normal lens configurations results in spherical aberration and coma which detract from signal strength and quality.

The solution: A wedge immersed-thermistor bolometer in which the thermistor flakes are immersed by optical contact on a wedge-shaped germanium lens

whose narrow dimension is clamped between two complementary wedge-shaped germanium blocks bonded with a suitable adhesive. This thermistor bolometer is placed behind the spectrometer entrance slit and the wedge configuration effectively forms a funnel that converges the incident energy on the thermistor flakes. Germanium is transparent to infrared energy and has a high refractive index.

How it's done: The germanium wedge lens has a semispherical front surface with an aspect ratio of about 5:1. The narrow edge of the wedge extends into a holder formed by two germanium wedges spaced by thin pieces of plastic that may be in the form of buttons or strips. The assembly is held

(continued overleaf)

together by a suitable epoxy cement. An active thermistor flake and a precisely matched compensating thermistor flake are immersed in the thin edge of the wedge lens with an insulating layer of arsenic-modified selenium. Electrical leads are connected to the thermistor flakes through areas of thinly deposited gold. The thinly deposited gold defines the active areas of the flakes that determine responsivity. The two thermistor elements are connected in a bridge circuit across a constant-voltage source. The semiconductive thermistor flakes have an inherently high temperature coefficient of electrical resistance. Impinging radiation generates heat in the gold-coated areas of the flakes and the resultant change in resistance is measured by the bridge circuit and associated electronics.

Notes:

1. This invention is not limited as to lens materials or optical radiation measured but may be operated with any optical radiation including the visible and with any transparent lens material.
2. This invention will effect marked improvement in noise equivalent power of a system in which the entrance pupil of the immersion optics has a high aspect ratio.
3. Title to this invention (covered by U.S. Patent No. 3,119,086) has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457 (f)) to the Barnes Engineering Company, 30 Commerce Road, Stamford, Connecticut.

Source: Marc. G. Dreyfus of
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